

## **AMENDMENTS TO THE CLAIMS**

Please replace the pending claims with the following claim listing:

1. **(Currently Amended)** An apparatus for producing crystals wherein a seed crystal is placed in a crucible retained in a furnace, raw materials filled in the crucible are heated and liquefied, and a crystal grown by slow cooling of the raw materials in the crucible from below upward, said apparatus comprising:

a temperature controlling means including a hollow constructed cap mounted directly outside the portion of the crucible where the seed crystal is placed, the cap being separated from a crucible support member, and means for regulating refrigerant flow running through the hollow portion;

wherein the overall cross section of the cap varies in size along the path direction of the refrigerant flow and the temperature controlling means performs cooling or heating in the vicinity of the seed crystal locally.

2. **(Canceled)**

3. **(Previously Presented)** The apparatus for producing the crystals according to Claim 1, wherein:

the cap is divided in multiple caps; and

the temperature controlling means comprises means for regulating independently refrigerant flow running through each hollow portion of the multiple caps.

4. **(Canceled)**

5. **(Previously Presented)** The apparatus for producing the crystals according to Claim 1, wherein the cap includes a heater and the temperature controlling means comprises means for performing conducting control to a heater with the refrigerant flow regulation.

6. **(Previously Presented)** The apparatus for producing the crystals according to Claim 1, wherein the material of the cap consists of one of a metal having conductive property, heat-resistant and corrosion-resistant of Pt or the equivalent, and an oxide having conductive property, heat-resistant and corrosion-resistant.

7. **(Currently Amended)** An apparatus for producing crystals wherein a seed crystal is placed in the crucible retained in a furnace, raw materials filled in a crucible are heated and liquefied, and a crystal grown by slow cooling of raw materials in the crucible from below upward, said apparatus comprising:

a temperature controlling means including a helical pipe mounted directly outside the portion of the crucible where the seed crystal is placed, the pipe being separated from a crucible support member, and means for regulating refrigerant flow running through the pipe;

wherein the refrigerant flow moves upward through at least a portion of the pipe and the cross section of the portion of the pipe through which the refrigerant flow moves upward varies in size along the path direction of the refrigerant flow and the temperature controlling means performs cooling or heating in the vicinity of the seed crystal locally.

8. **(Original)** The apparatus for producing the crystals according to Claim 7 wherein the temperature controlling means regulates the refrigerant flow by introducing refrigerant running through the pipe from lower portion of the seed crystal and discharging to the upper portion thereof.

9. **(Previously Presented)** The apparatus for producing the crystals according to Claim 7 wherein:

the pipe is divided in multiple pipes; and

the temperature controlling means comprises a means for regulating independently refrigerant flow regulation running through each of the multiple pipes.

10. **(Canceled)**

11. **(Previously Presented)** The apparatus for producing the crystals according to Claim 7, wherein the pipe includes a heater and the temperature controlling means comprises means for performing conducting control to a heater with the refrigerant flow regulation.

12. **(Previously Presented)** The apparatus for producing the crystals according to Claim 7, wherein the material of the pipe consist of one of a metal having conductive property, heat-resistant and corrosion-resistant of Pt or the equivalent, and an oxide having conductive property, heat-resistant and corrosion-resistant.

13-16. **(Canceled)**

17. **(Currently Amended – incorporate claim 23)** An apparatus for producing crystals by slow cooling of a raw material solution from below upward, the apparatus comprising:

- a crucible configured to receive a seed crystal and raw materials, the crucible having a lower portion in which the seed crystal is placed;

- a heating element configured to heat and liquefy the raw materials disposed within the crucible so as to form a raw material solution;

- a crucible support member on which the crucible rests; and

- temperature controlling means that perform local cooling or heating of the lower portion of the crucible, the temperature controlling means comprising:

- a refrigerant flow element positioned adjacent to the lower portion of the crucible, the refrigerant flow element configured to allow a refrigerant to flow therethrough, the refrigerant flow element being physically separated from the crucible support member, wherein an overall cross section of the refrigerant flow element varies in size along the path direction of the refrigerant flow; and

- means for regulating flow of the refrigerant through the refrigerant flow element.

18. **(Previously Presented)** The apparatus for producing crystals according to Claim 17, wherein the refrigerant flow element comprises a hollow cap.

19. **(Previously Presented)** The apparatus for producing crystals according to Claim 17, wherein:

the refrigerant flow element comprises a plurality of hollow caps; and

the means for regulating flow of the refrigerant through the refrigerant flow element comprises means for independently regulating refrigerant flow running through each hollow portion of the plurality of caps.

20. **(Previously Presented)** The apparatus for producing crystals according to Claim 17, wherein the refrigerant flow element comprises a helical pipe.

21. **(Previously Presented)** The apparatus for producing crystals according to Claim 20 wherein the helical pipe is configured to receive the refrigerant at a bottom portion thereof and discharge the refrigerant at an upper portion thereof.

22. **(Previously Presented)** The apparatus for producing crystals according to Claim 17, wherein the refrigerant flow element includes a heater and the temperature controlling means further comprises means for performing conducting control to the heater.

23. **(Canceled)**

24. **(New)** The apparatus for producing crystals according to Claim 1, wherein the refrigerant flow moves upward through at least a portion of the cap and the cross section of the portion of the cap through which the refrigerant flow moves upward varies in size along the upward path direction of the refrigerant flow.

25. **(New)** The apparatus for producing crystals according to Claim 1, wherein the cap encircles the crucible.

26. **(New)** The apparatus for producing crystals according to Claim 7, wherein the portion of the pipe through which the refrigerant flow moves upward abuts the crucible.

27.     **(New)** The apparatus for producing crystals according to Claim 17, wherein at least a portion of the refrigerant flow element is configured to allow a refrigerant to flow upward therethrough, and the cross section of the portion of the refrigerant flow element varies in size along the upward path direction of the refrigerant flow.

28.     **(New)** The apparatus for producing crystals according to Claim 17, wherein a portion of the refrigerant flow element abuts the crucible and the cross section of the portion of the refrigerant flow element that abuts the crucible varies in size along the path direction of the refrigerant flow.